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REFERENCES

1. Parodi JC, Palmaz JC, Barone HD. Transfemoral intraluminal graft implantation for abdominal aortic aneurysms. Ann Vasc Surg 1991;5:491-9.
2. Schermerhorn ML, O'Malley AJ, Jhaveri A, Cotterill P, Pomposelli F, Landon BE. Endovascular vs. open repair of abdominal aortic aneurysms in the Medicare population. N Engl J Med 2008;358:464-74.
3. Prinssen M, Buskens E, Blankensteijn JD, DREAM trial participants. Quality of life endovascular and open AAA repair. Results of a randomised trial. Eur J Vasc Endovasc Surg 2004;27:121-7.
4. Greenhalgh RM, Brown LC, Kwong GP, Powell JT, Thompson SG, EVAR trial participants. Comparison of endovascular aneurysm repair with open repair in patients with abdominal aortic aneurysm (EVAR trial 1), 30-day operative mortality results: randomised controlled trial. Lancet 2004;364:843-8.
5. EVAR trial participants. Endovascular aneurysm repair and outcome in patients unfit for open repair of abdominal aortic aneurysm (EVAR trial 2): randomised controlled trial. Lancet 2005;365:2187-92.
6. Steinmetz E, Rubin BG, Sanchez LA, Choi ET, Geraghty PJ, Baty J, et al. Type II endoleak after endovascular abdominal aortic aneurysm repair: a conservative approach with selective intervention is safe and cost-effective. J Vasc Surg 2004;39:306-13.
7. Silverberg D, Baril DT, Ellozy SH, Carroccio A, Greyrose SE, Lookstein RA, et al. An 8-year experience with type II endoleaks: natural history suggests selective intervention is a safe approach. J Vasc Surg 2006;44:453-9.
8. Higashiura W, Greenberg RK, Katz E, Geiger L, Bathurst S. Predictive factors, morphologic effects, and proposed treatment paradigm for type II endoleaks after repair of infrarenal abdominal aortic aneurysms. J Vasc Interv Radiol 2007;18:975-81.
9. Rubin BG, Marine L, Parodi JC. An algorithm for diagnosis and treatment of type II endoleaks and endotension after endovascular aneurysm repair. Perspect Vasc Surg Endovasc Ther 2005;17:167-72.
10. Sheehan MK, Ouriel K, Greenberg R, McCann R, Murphy M, Fillinger M, et al. Are type II endoleaks after endovascular aneurysm repair endograft dependent? J Vasc Surg 2006;43:657-61.
11. Gelfand DV, White GH, Wilson SE. Clinical significance of type II endoleak after endovascular repair of abdominal aortic aneurysm. Ann Vasc Surg 2006;20:69-74.
12. van Marrewijk CJ, Fransen G, Laheij RJ, Harris PL, Buth J, EUROSTAR Collaborators. Is a type II endoleak after EVAR a harbinger of risk? Causes and outcome of open conversion and aneurysm rupture during follow-up. Eur J Vasc Endovasc Surg 2004;27:128-37.
13. Lin JC, Eun D, Shrivastava A, Shepard AD, Reddy DJ. Total robotic ligation of inferior mesenteric artery for type II endoleak after endovascular aneurysm repair. Ann Vasc Surg 2009;23:e219-21.
14. Pilon F, Tosato F, Danieli D, Campanile F, Zaramella M, Milite D. Intrasac fibrin glue injection after platinum coils placement: the efficacy of a simple intraoperative procedure in preventing type II endoleak after endovascular aneurysm repair. Interact Cardiovasc Thorac Surg 2010;11:78-82.
15. Muthu C, Maani J, Plank LD, Holden A, Hill A. Strategies to reduce the rate of type II endoleaks: routine intraoperative embolization of the inferior mesenteric artery and thrombin injection into the aneurysm sac. J Endovasc Ther 2007;14:661-8.
16. Mansueto G, Cenzi D, Scuro A, Gottin L, Griso A, Gumbs AA, et al. Treatment of type II endoleak with a transcatheter transcaval approach: results at 1-year follow-up. J Vasc Surg 2007;45:1120-7.
17. Gorlitzer M, Mertikian G, Trnka H, Froeschl A, Meinhart J, Weiss G, et al. Translumbar treatment of type II endoleaks after endovascular repair of abdominal aortic aneurysm. Interact Cardiovasc Thorac Surg 2008;7:781-4.
18. Zanchetta M, Faresin F, Pedon L, Ronsivalle S. Intraoperative intrasac thrombin injection to prevent type II endoleak after endovascular abdominal aortic aneurysm repair. J Endovasc Ther 2007;14:176-83.
19. Giannoni MF, Fanelli F, Citone M, Cristina Acconcia M, Speziale F, Gossetti B. Contrast ultrasound imaging: the best method to detect type II endoleak during endovascular aneurysm repair follow-up. Interact Cardiovasc Thorac Surg 2007;6:359-62.
20. Hiramoto JS, Howell B, Reilly LM, Chuter TA. Effect of systemic blood pressure on aneurysm size in the presence of a type II endoleak. Vascular 2008;16:321-5.
21. Truijers M, Resch T, Van Den Berg JC, Blankensteijn JD, Lonn L. Endovascular aneurysm repair: state-of-art imaging techniques for preoperative planning and surveillance. J Cardiovasc Surg (Torino) 2009;50:423-38.

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INVITED COMMENTARY

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This article questions our current assumptions concerning the treatment outcomes of type II endoleaks. While it is generally acknowledged that these leaks occur frequently and are usually merely annoying, the results of treating more pernicious type II endoleaks that are accompanied by sac enlargement are largely unknown. These latter leaks, while rare, are often complicated, involving several sets of lumbar arteries, the inferior mesenteric artery, and extensive collateral networks. It is not surprising that simple embolization of the lumber, mesenteric, or internal iliac branches would not control these leaks. In fact, several groups have pointed this out, recommending translumbar approaches with coils and glue, and insisting on complete obliteration of the leak "nidus" within the sac.

Until now, many of us probably thought that this direct sac approach would be definitive and long-lasting. This article questions that assumption by indicating that 72% of patients who underwent treatment had not only persistent leaks, but more important, continuing sac growth. But probably the authors' most important point is that the aneurysms of some patients with persistent type II leaks and sac enlargement harbor unsuspected type I or type III leaks. Thus, they recommend angiography on all patients with any type of leak and an enlarging aneurysm. This advice is reasonable and widely accepted.

The authors recognize several weaknesses in their evaluation of their data. The most glaring is the inability of the authors to evaluate almost 60% of the preoperative computed tomography scans, relying on the initial radiologic report, a practice fraught with inaccuracies. While this damages the calculations of the preoperative slope value, it does not change the fact that the leaks persisted or recurred despite treatment. In addition, the reader has to accept the complete abolition of the endoleak since no images were provided. Furthermore, the interventional radiologist who performed the procedures favored translumbar sac embolization over other modalities.

As any good article should, the report raises questions: Should there be a size threshold reached before treatment of type II leaks? Does sac enlargement of 5 mm in a 5-cm aneurysm have the same prognosis as 5 mm growth in an 8-cm aneurysm? Should we perform angiography on patients with a long infrarenal neck, small aneurysm, and 5-mm sac increase? What is the best method for imaging and treating these leaks? Hopefully, this article will stimulate other groups to look at their data and help answer these questions.